

**WHAT IS CLAIMED IS:**

1. A processing method that uses process gas plasma that contains at least hydrogen to terminate  
5 dangling bonds in an object that at least partially contains a silicon system material, said processing method comprising the steps of:

placing the object on a susceptor in a process chamber that includes a dielectric window and  
10 the susceptor, and controlling a temperature of the susceptor to a predetermined temperature;

controlling a pressure in the process chamber to a predetermined pressure;

introducing the process gas into the process  
15 chamber; and

introducing, via the dielectric window, microwaves for a plasma treatment to the object into the process chamber so that plasma of the process gas has plasma density of  $10^{11}$  cm<sup>-3</sup> or greater, wherein a  
20 distance between the dielectric window and the object is maintained between 20 mm and 200 mm.

2. A processing method according to claim 1, wherein the plasma treatment requires no bias  
25 application.

3. A processing method according to claim 1,  
wherein said step of introducing the microwaves  
previously regulates an output of a microwave generator  
that supplies the microwaves, so as to obtain the  
5 plasma density.

4. A processing method according to claim 1,  
wherein the distance is between 50 mm and 150 mm.

10 5. A processing method according to claim 1,  
wherein the predetermined temperature is between 200 °C  
and 400 °C.

6. A processing method according to claim 1,  
15 wherein the predetermined pressure is between 13 Pa and  
665 Pa.

7. A processing method according to claim 1,  
wherein said step of controlling the pressure includes  
20 the steps of:

igniting plasma under a pressure higher than  
the predetermined pressure; and

changing the pressure to the predetermined  
pressure after said igniting step.

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8. A processing method according to claim 1,  
wherein the dielectric window has a thermal

conductivity of  $70 \text{ W} / \text{m} \cdot \text{K}$  or greater.

9. A processing method according to claim 1,  
wherein said step of introducing the microwaves uses an  
5 antenna that has one or more slots to introduce the  
microwaves into the dielectric window.

10. A processing method according to claim 1,  
wherein the process gas includes inert gas at least at  
10 the time of plasma ignition.

11. A processing apparatus that provides a plasma  
treatment to and terminates dangling bonds in an object  
that at least partially contains a silicon system  
15 material, said processing apparatus comprising:

a process chamber, connected to a microwave  
generator for supplying microwaves, which includes a  
dielectric window that allows the microwave from the  
microwave generator to be introduced into said process  
20 chamber, and a susceptor that supports the object;

an introducing part for introducing process  
gas that contains at least hydrogen gas into the  
process chamber;

a measurement part for measuring a plasma  
25 discharge state of plasma of the process gas; and  
a controller for comparing a measurement  
result by said measurement part with a reference value

to maintain plasma density to be  $10^{11} \text{ cm}^{-3}$  or greater,  
and for giving an alarm as abnormal discharge when  
determining that the plasma density becomes below  $10^{11}$   
 $\text{cm}^{-3}$ , wherein a distance between the dielectric window  
5 and the object is maintained between 20 mm and 200 mm.